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APPLICATION NUMBER: 60/555,576

FILING DATE: *March 23, 2004*

RELATED PCT APPLICATION NUMBER: PCT/US05/09288



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032304

02570 U.S. PTO

PTO/SB/18 (01-04)

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PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53(c).

Express Mail Label No. EV 308276937 US

22386 U.S. PTO
60/555576

INVENTOR(S)					
Given Name (first and middle (if any))		Family Name or Surname		Residence (City and either State or Foreign Country)	
DONALD		CLARY		RANCHO PALOS VERDES, CALIFORNIA	
Additional inventors are being named on the _____ separately numbered sheets attached hereto					
TITLE OF THE INVENTION (500 characters max)					
THERMAL MANAGEMENT OF LAMPS IN A BACKLIGHT SYSTEM					
Direct all correspondence to: CORRESPONDENCE ADDRESS					
<input checked="" type="checkbox"/> Customer Number:		23906			
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ENCLOSED APPLICATION PARTS (check all that apply)					
<input checked="" type="checkbox"/> Specification Number of Pages		4		<input type="checkbox"/> CD(s), Number	
<input checked="" type="checkbox"/> Drawing(s) Number of Sheets		7		<input checked="" type="checkbox"/> Other (specify)	
<input type="checkbox"/> Application Date Sheet. See 37 CFR 1.76		Fee Sheet Postal Receipt			
METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT					
<input type="checkbox"/> Applicant claims small entity status. See 37 CFR 1.27.				FILING FEE Amount (\$)	
<input type="checkbox"/> A check or money order is enclosed to cover the filing fees.				\$160.00	
<input checked="" type="checkbox"/> The Director is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 04-1928					
<input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.					
The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.					
<input checked="" type="checkbox"/> No.					
<input type="checkbox"/> Yes, the name of the U.S. Government agency and the Government contract number are: _____					

Respectfully submitted,

[Page 1 of 2]

Date March 23, 2004

SIGNATURE Lois A. Santopietro

REGISTRATION NO. 36,264

TYPED or PRINTED NAME LOIS A. SANTOPIETRO

(if appropriate)
Docket Number: DH0016USPRV

TELEPHONE (302) 892-7752

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

This collection of information is required by 37 CFR 1.51. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 8 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Mail Stop Provisional Application, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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**FEE TRANSMITTAL
for FY 2004**

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27**TOTAL AMOUNT OF PAYMENT (\$)** 160.00**Complete if Known**

Application Number	
Filing Date	March 23, 2004
First Named Inventor	Donald Clary
Examiner Name	
Art Unit	
Attorney Docket No.	DH0016USPRV

METHOD OF PAYMENT (check all that apply)☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None☒ Deposit Account:

Deposit Account Number	04-1928
Deposit Account Name	E. I. du Pont de Nemours and Company

The Director is authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments☒ Charge any additional fee(s) or any underpayment of fee(s)☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.**FEE CALCULATION****1. BASIC FILING FEE**

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 770	2001 385	Utility filing fee	
1002 340	2002 170	Design filing fee	
1003 530	2003 265	Plant filing fee	
1004 770	2004 385	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	160.00
SUBTOTAL (1) (\$)			160.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

Total Claims	Extra Claims	Fee from below	Fee Paid
Independent Claims	-20** =	X 18 =	
Multiple Dependent	-3** =	X 88 =	
			290.00

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1202 18	2202 9	Claims in excess of 20	
1201 86	2201 43	Independent claims in excess of 3	
1203 290	2203 145	Multiple dependent claim, if not paid	
1204 86	2204 43	** Reissue independent claims over original patent	
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent	
SUBTOTAL (2) (\$)			0.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)**3. ADDITIONAL FEES**

Large Entity Small Entity

Fee Code (\$)	Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	2053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for <i>ex parte</i> reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 420	2252 210	Extension for reply within second month	
1253 950	2253 475	Extension for reply within third month	
1254 1,480	2254 740	Extension for reply within fourth month	
1255 2,010	2255 1,005	Extension for reply within fifth month	
1401 330	2401 165	Notice of Appeal	
1402 330	2402 165	Filing a brief in support of an appeal	
1403 290	2403 145	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,330	2453 665	Petition to revive - unintentional	
1501 1,330	2501 665	Utility issue fee (or reissue)	
1502 480	2502 240	Design issue fee	
1503 640	2503 320	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 770	2809 385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 770	2810 385	For each additional invention to be examined (37 CFR 1.129(b))	
1801 770	2801 385	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) 0.00**SUBMITTED BY**

Name (Print/Type)	Lois A. Santopietro
Signature	<i>Lois A. Santopietro</i>

Registration No. (Attorney/Agent)	36,264
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(Complete if applicable)

Telephone	(302) 892-7752
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Date	March 23, 2004
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TITLE

THERMAL MANAGEMENT OF LAMPS IN A BACKLIGHT SYSTEM
FIELD OF THE INVENTION

5 The present invention is directed to a lamp arrangement found in a display wherein a backlight includes at least two lamps having cathodes at each end and wherein the lamps are in a juxtaposed position and the cathodes of the lamps are not touching.

SUMMARY OF THE INVENTION

10 The invention is directed to a backlight system comprising: at least two juxtaposed cold cathode lamps wherein each lamp comprises cathodes at each end and wherein the lamps are positioned in a manner that the cathodes are not touching. The invention is further directed to a system of wherein the lamp cathodes are juxtaposed and longitudinally offset. The system is still further directed to wherein the lamps are juxtaposed and are not touching, or wherein the
15 lamps are juxtaposed and are touching.

BRIEF DESCRIPTION OF THE DRAWING

Figures 1-7 illustrate lamp arrangements in backlight systems of liquid crystal displays.

DETAILED DESCRIPTION OF THE INVENTION

20 A lamp arrangement increases luminance in a Liquid Crystal Display (LCD). LCDs need a light source to be readable in natural and artificial lighting conditions. Figure 1 illustrates a light source (101) placed behind a LCD wherein the light source is called a backlight.

25 A backlight system typically includes one or more light sources such as cold cathode fluorescent lamps (CCFLs)(101) that inject light into a component, called a light guide (102). In addition, a reflector (not shown) may be a component of the system. The light guide may be a rectangular solid of transparent material, for example, an acrylic but any material that is typically used in the industry for a light guide may be used. The purpose of the light guide in a
30 liquid crystal display (LCD) backlight system is to transport light from the lamps into the light guide, bend the light for example about 90°, and distribute the light across the rear surface of a LCD.

35 CCFLs are often used in backlighting LCDs or in automotive lighting. The miniature lamps can be long straight cylinders in a range of 1.8mm to 4mm in diameter, and a length from 25mm to 400mm. The straight cylinders may be formed into L or U bend lamps.

Cold cathode lamps have no special heating circuits in the cathode regions (at each end of the lamps). The typical office lighting fluorescent lamps are much

larger, and have specialized cathode-heating circuits, therefore, are called hot cathode fluorescent lamps.

In one embodiment, the most widely used CCFL lamps used in the industry today operate most efficiently at an optimum temperature of about 50°C.

5 That is, more light is created from a given amount of electrical power at their optimum temperature than any other temperature. If the lamp deviates from its optimum temperature, for instance, it may operate colder or hotter from its optimum designated temperature, the light output diminishes, and drops off rapidly from its peak performance.

10 In a typical LCD configuration, a backlight system will often have one lamp on each of the two long lateral sides of a rectangular light guide (two lamps total). In this case, the lamps typically will not exceed the optimum temperature. Figure 2 shows an illustration of applications requiring more light; often two lamps (201) found in a juxtaposed position on each of the two long lateral sides of
15 the light guide (4 lamps total). In this case, the lamps will operate at a temperature above the optimum, and will have reduced light output. Juxtaposed position means placed side-by-side or adjacent. The lamps and/or cathodes may be touching or may not be touching.

The hottest region of the CCFL lamp is at the ends, where the cathodes are
20 located. If the paired lamps are placed in contact with an acrylic light guide (202), the cathodes may slightly melt the acrylic where the cathodes touch the acrylic. This is because the two cathodes are generating a great deal of heat in a small area. The paired cathodes are in juxtaposed position with no offset as shown in Figure 2.

25 Figure 3 illustrates one of the paired lamps (301) juxtaposed but shifted longitudinally or longitudinally offset by a small distance (about 4 or more millimeters). In the offset position, the cathodes are not touching each other and are generating the same amount of heat as in the parallel position but the heat is dissipated over a much larger area, wherein the lamps operate cooler and closer to
30 their optimum temperature producing optimum light output. When one lamp of a pair of equal length lamps is longitudinally offset, the cathodes at the other end are offset by an equal amount. Thus, you get thermal benefits at both ends of the paired lamps. For example, an offset pair of CCFLs gives a luminance gain of about 20% as compared to the same pair with the cathodes positioned side by side
35 to each other with no offset.

In another embodiment, the thermal management concept is further illustrated in Figure 4, if a trio (401) of CCFLs is placed on each of the two long lateral sides of a light guide (6 lamps total), the lamps reach optimum temperature

at about 10 seconds from power turn-on, resulting in a drop in light output as the lamps overheat from continued use. Therefore, this would not be a practical arrangement. Therefore, 3 lamps touching and positioned side by side with no offset is typically not used.

5 However, in another embodiment shown in Figure 5, if the light guide (501) is made thicker, and the lamps are placed so that the cathodes of the lamps are not touching (502) wherein the center lamp of a 3-lamp trio is longitudinally offset relative to the outside lamp (503) of the trio, the lamps run cool and make an effective design.

10 Another embodiment of the thermal management concept is illustrated in Figure 6, placing 4 lamps (601) of CCFLs on each of the two long lateral sides of a light guide (602) (8 lamps total), the thermal management becomes impractical with the passive cooling techniques. This can be remedied by place two lamps side by side but not longitudinally offset on each of the 4 lateral sides of the light
15 guide which will decrease the amount of heat created by the cathodes.

 However, Figure 7 illustrates a pair of lamps arranged on each of the 4 lateral sides of a rectangular light guide (701, 702, 703, 704) (8 lamps total), wherein one lamp is longitudinally shifted of each of the four pairs, resulting in an 8 lamps embodiment able to operate at an efficient temperature.

20 In conclusion, lamps become more efficient in a backlight system comprising at least two juxtaposed cold cathode lamps wherein each lamp comprises cathodes at each end and wherein the lamps are positioned in a manner that the cathodes are not touching. Also, it is desirable to longitudinally offset the
25 cathodes.

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CLAIMS

We Claim:

1. A backlight system comprising: at least two juxtaposed cold cathode lamps wherein each lamp comprises cathodes at each end and wherein the lamps
5 are positioned in a manner that the cathodes are not touching.
2. The system of claim 1 wherein the cathodes are juxtaposed and longitudinally offset.
3. The system of claim 1 wherein the lamps are juxtaposed and are not touching.
- 10 4. The system of claim 1 wherein the lamps are juxtaposed and are touching.

15

Docket No.: DH0016USPRV
Inventor: Donald Clary
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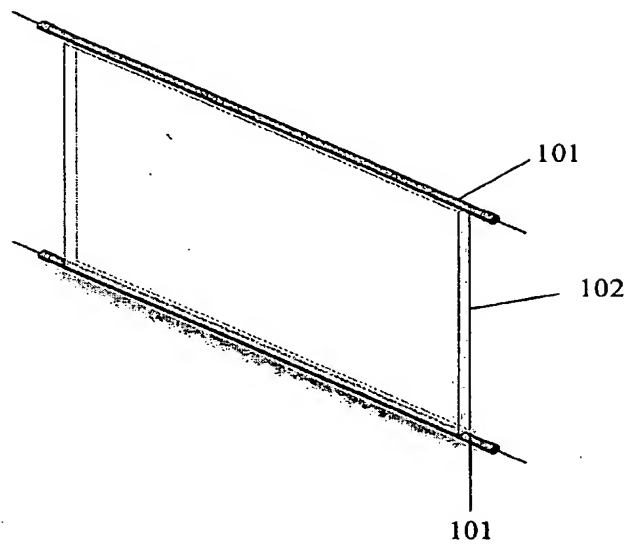


Figure 1

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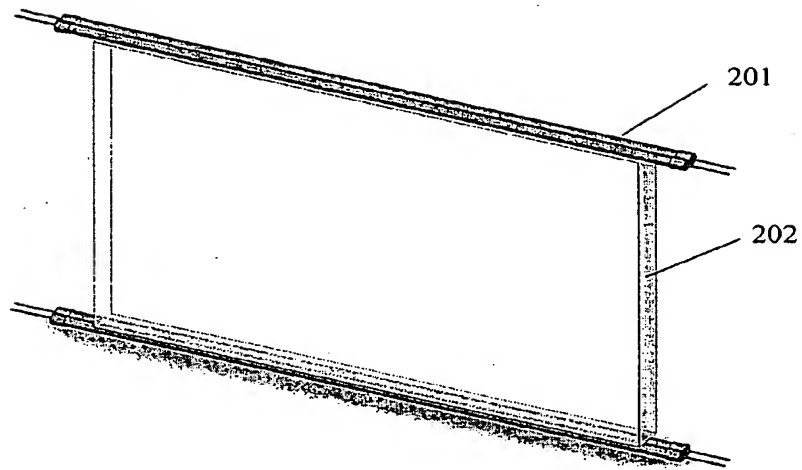


Figure 2

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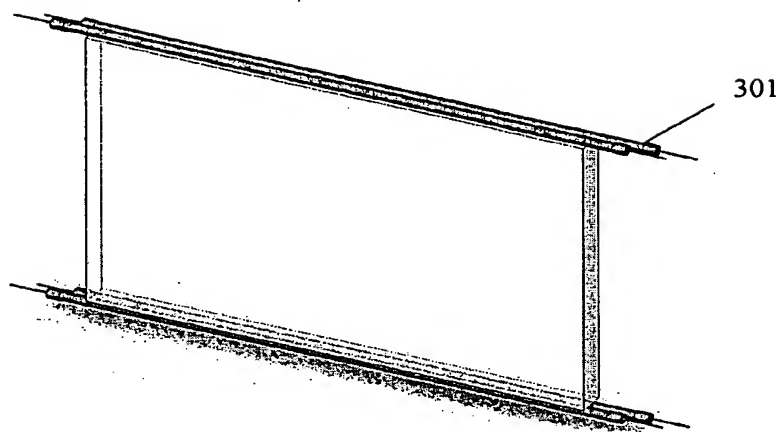


Figure 3

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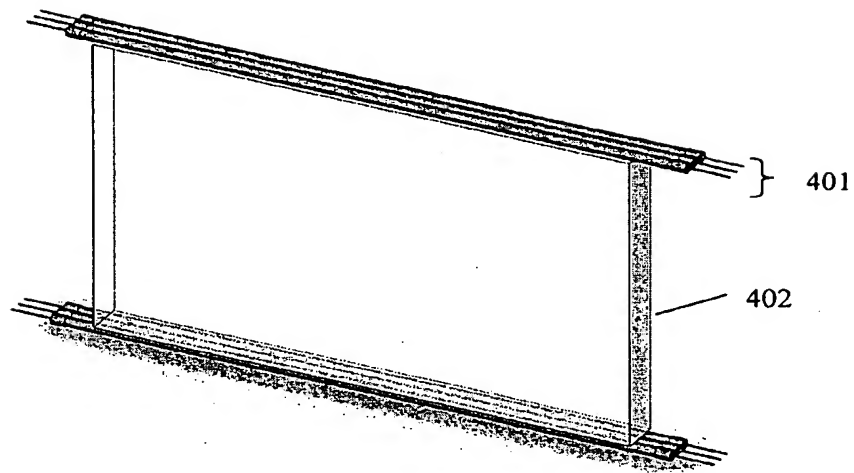


Figure 4

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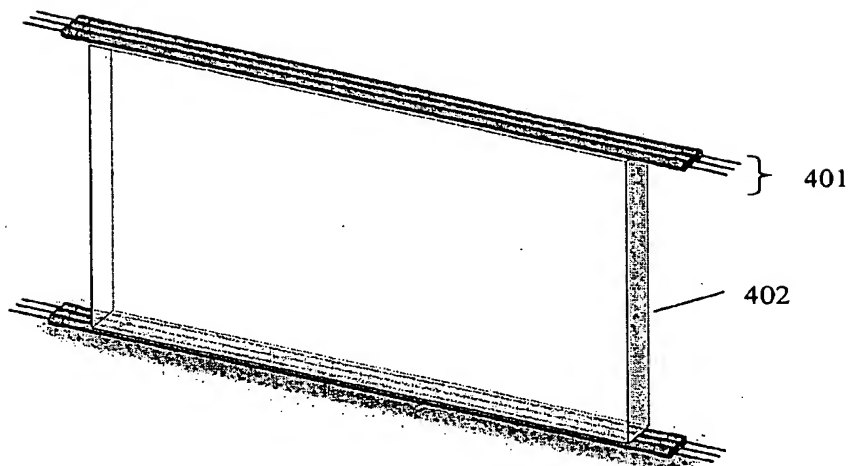


Figure 4

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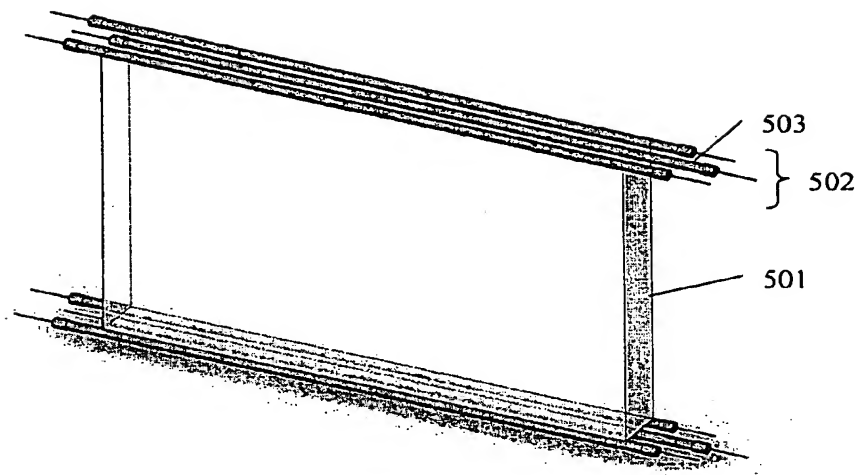


Figure 5

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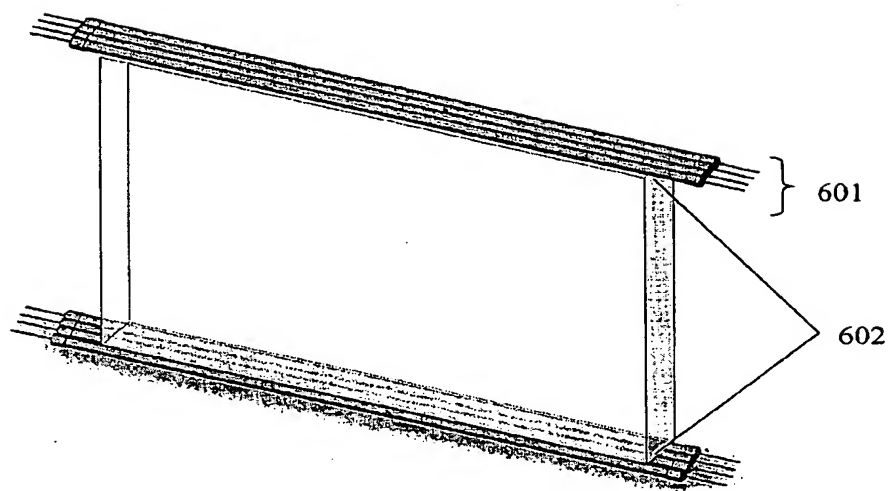


Figure 6

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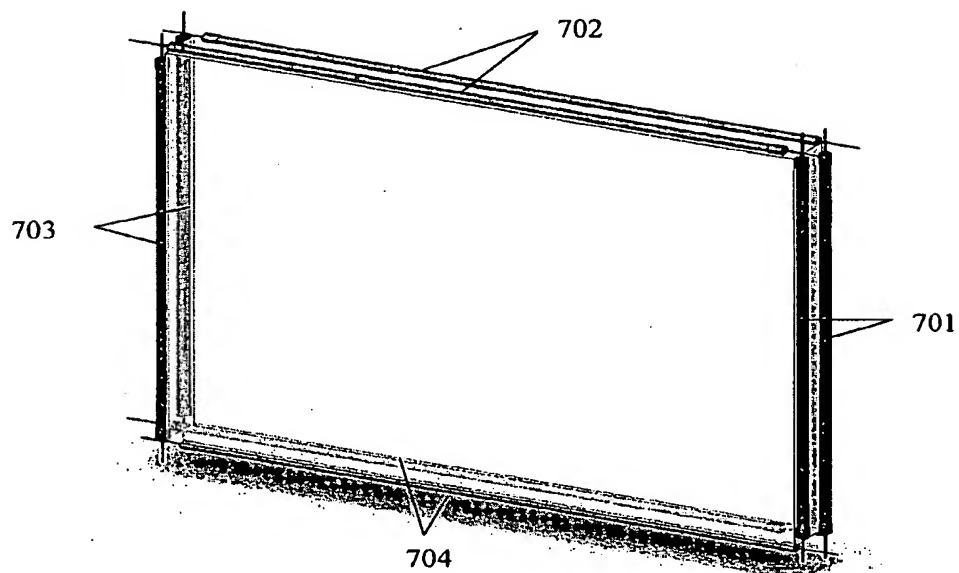


Figure 7

From the INTERNATIONAL BUREAU

PCTNOTIFICATION CONCERNING
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OF PRIORITY DOCUMENT

To:

SANTOPIETRO, Lois, A.
E. I. Du Pont De Nemours And Company
Legal Patent Records Center
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Wilmington, Delaware 19805
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(PCT Administrative Instructions, Section 411)

Date of mailing (day/month/year) 14 June 2005 (14.06.2005)	
Applicant's or agent's file reference DH0016PCT	IMPORTANT NOTIFICATION
International application No. PCT/US2005/009288	International filing date (day/month/year) 21 March 2005 (21.03.2005)
International publication date (day/month/year)	Priority date (day/month/year) 23 March 2004 (23.03.2004)
Applicant E.I. DUPONT DE NEMOURS AND COMPANY et al	

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<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
23 March 2004 (23.03.2004)	60/555,576	US	02 May 2005 (02.05.2005)

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